are found, they are in layers parallel with the strata, and invariably have the major axis in its direction. Where they are of small size they are not numerous, but when large they frequently lie so close together as to form a continuous course. They are never found in roofs of rock or hard shale, but in the softer shale called "Blue Metal."

It is remarkable that coal fossils are rarely ever amongst these ellipsoids, though fossil ferns and *Sigillaria* are sometimes found a few feet from them, but, as a rule, where the one is plentiful the other is scarce; they are always found above the coal and never below it.

These "Ball Mine," as they are locally called in South Wales, do not exist in every seam of that coal-field, but I believe they are in greater quantities and larger in that district than elsewhere. The proportion is about 5 tons to every 400 tons of coal; from twenty to fifty weigh a ton. Similar nodules are found in some seams in Yorkshire and Lancashire, where they are known by the name of "Doggers" and "Bullions;" occasionally, too, they are met with in North Wales; in fact, they are characteristic of certain seams in certain districts. They are not in every coal district, nor when they are found in one seam of a district does it follow that they are in another of the same district; and they are more numerous in connection with steam than with house coal.

In conclusion, the author thought the occurrence of these ferruginous bodies deserved careful attention, and he promised to give all the information he could obtain on the subject.

VISIT TO THE BRITISH MUSEUM.

(SOUTH AFRICAN REPTILIAN REMAINS.)

APRIL 14TH, 1877.

Director—PROFESSOR OWEN, C.B., LL.D., F.R.S., &c.

(*Report by* DR. J. FOULERTON, F.G.S.)

Professor Owen having met the party in the North Gallery, led the Members to the cases containing the Reptilian Remains from South Africa, which the learned Director then described.

During the Liassic, the Triassic, and, perhaps, also the Permian periods, lakes or estuaries, much larger than the lakes at present known in Central Africa, occupied a tract of the southern portion

of that continent, extending northwards from N. Lat. 35° , and eastwards from E. long. 19.45° . In the mud and sand deposited by these waters were buried the remains of the plants and animals which occupied the adjacent land-surfaces, and amongst others those of the Reptilia, to which I now wish to draw your attention. The thickness of these lacustrine and estuarine deposits, represented now by shales and sandstones, injected with trappean and other igneous rocks, exceed 11,000 feet. They have been elevated into a high table-land, traversed by mountain ranges, the chief of which, singularly enough, has received the name of "Drachenberg." At the localities richest in the remains before us, the original mud has been converted into a quartzose sandstone of extreme hardness. The first examples of these fossils were discovered by Mr. A. Geddes Bain, in blasting the rocks for a military road in 1838; others have been annually transmitted to the present time. The highest grade of organisation determinable in these fossils is reptilian; no tooth or other trace of mammalian life has been detected. But they revealed an interesting and unexpected fact, viz., that many of the Reptilian remains presented certain characteristics now only found in Mammalia, and particularly in the order Carnivora; thus, the large upper canine teeth of this huge carnivorous reptile (exhibiting the skull of the *Lycosaurus tigrinus*) resembled those of the extinct sabre-toothed *Machairodus*, in their proportions as well as shape, even to the finely serrated edge; the canines descending outside the lower jaw, like those of the walrus and musk-deer. The humerus, also, of this carnivorous reptile presents the foramen or canal for the passage of a nerve or vessel above the internal condyle, as in the Feline carnivora. Yet the bones and sutures of the skull, its shape and the small size of the brain cavity, prove the remains exhibited to be those of a reptile.

With these lethal canines are associated incisors and molars of the ferine type, and more distinct in their several kinds than had hitherto been observed in the Reptilian class; such reptiles, of which several generic and specific modifications were shown, had, therefore, been grouped in a distinct Order termed Theriodontia.

When there were such carnivorous reptiles, armed with formidable canine teeth, we might be sure that there were correspondingly large herbivorous animals of some kind for them to prey

upon. Accordingly were next shown the remains of large herbivorous reptiles, known to be such by the nature of their crushing and grinding teeth, and by the impressions on the bones of the skull and processes for the attachment of the large muscles which move the jaw backwards and forwards. Of these reptiles examples of the genera *Tapinocephalus*, *Pareiasaurus* and *Anthodon* were exhibited. They are *Dinosaurian*, but of an earlier or lower type than our European Mesozoic kinds. The vertebræ were only partially ossified, and in *Anthodon* were biconcave, resembling, in this particular, the vertebræ of fishes. A tube filled with gelatinous matter had passed through the vertebral bodies of *Pareiasaurus*, with flatter articular surfaces : forming a continuous moniliform canal, from before backwards, originally filled by the remains of the embryonic structure called the notochord. Some of these reptiles had only two large canine teeth in the upper jaw, thence called *Dicynodont*, and had no teeth at all in the lower. Of this order were shown specimens of a singular genus (*Ptychognathus*), whose triangular skull, marked with prominent ridges, had almost a crystalline outline. These *Dicynodonts* had large temporal muscles, showing that they were carnivorous. Others of these reptiles had no teeth at all in the adult state, and were accordingly called *Oudenodonts*. From the trenchant margins of the jaws they were probably carnivorous, like the snapping turtles of America.

But one of the strangest of these fossil reptilian skulls was of the genus *Endothiodon*, in which the palate, like that of some fishes, and also as in the extinct reptilian *Placodus*, of European Trias, was armed with crushing palatal teeth. The lower jaw also had corresponding teeth, though not so many as the upper. A small skull from the Koonap deposits, with two condyles for articulation with the vertebral column, showing it to have been an Amphibian or Batrachian, was finally demonstrated as claiming by its characters to be a member of the Labyrinthodont family.

In other parts of the world—in Germany, in Russia, in Nova Scotia, and in Central India—reptilian remains have been found in some respects similar to those obtained from South Africa. These palæontological facts, added to others derived from the distribution of some recent species, suggested, the Professor finally remarked, other geographical features of the globe than now characterise its surface, and the Indian *Dicynodonts* indicate that

there might once have been direct land communication between South Africa and India of which Madagascar, the Mauritius, and other islands of the Indian Ocean, are now the only remains.

EXCURSION TO GRAYS, ESSEX.

APRIL 21ST, 1877.

The weather was so extremely unfavourable that only a small number of Members assembled at Fenchurch Street Station, and the idea of abandoning the excursion was entertained, but, encouraged by Mr. M. Hawkins Johnson, the party took train, when the weather became comparatively fine. On arrival at Grays, Mr. Johnson led the way to the great Chalk pit, where he pointed out the peculiar junction of the Upper Chalk with the overlying later deposits, marked, as it is at this place, by deep indentations or "pipes" filled partly with Lower Tertiary and partly with Pleistocene sands.

The well-known brick-pit, which has yielded so many mammalian remains, and the sections in which expose so well the Post-Pleiocene beds of the Lower Thames Basin, was then visited. Notwithstanding a diligent search, a portion of a tibia, probably of *Bos primigenius* was the only mammalian fossil found, though remains of *Elephas* are sometimes by no means uncommon. The usual genera of Mollusca, *Cyrena*, *Unio*, *Valvata* and *Bithynia* were, however, easily obtained.

Notices of the Geology and Palæontology of Grays have already appeared in these pages. See Reports of Excursions to Grays, Vol. ii. p. 29, and p. 245, and Vol. iv., p. 123.